

Profilography

Pablo Garcia

pgarcia@saic.edu

School of the Art Institute of Chicago, USA

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Abstract: This art project exploits digital modeling and fabrication techniques to reexamine historical images. Using a process I call Profilography — tracing and extruding a series of sequential contours or profiles — I transform serial or morphological images from art history into contemporary works of digital art. The goal of project is to connect proto-digital art — analog in craft yet ‘digital’ in conception — to the software and hardware of today. This both expands the reach of historical art into today’s computational environment and creates a rich historical context for digital art.



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1. Introduction

What would artists from the distant past do with a computer? At a glance, it seems that it would be a strange device to their analog sensibilities. From today's vantage point, some artists could be considered 'digital', even though it would be generations before computational technology would transform the art world. Artists using technology to automate processes, or making images through logical, serial, and analytical thinking predate computers, but their methodologies are quite familiar to digital artists today. One way to explore the 'digital' nature of work from centuries ago is to apply digital technologies to historical works.

For this art project, I selected two artists — Albrecht Dürer and Eadweard Muybridge — to reconsider. Centuries apart, each artist explored techniques that, using a computer, would be welcome in today's digital paradigm. In *Four Books on Human Proportion* (1528), Dürer presents an exhaustive morphological study of human form. Ostensibly a guide for artists drawing the human figure, from today's digital viewpoint, the book reads like computer code applied to produce theme and variation from an initial figure. This parametric distortion is easy with a computer. Dürer worked by hand, meticulously using rulers and arithmetic to produce his treatise.

Muybridge was a 19th century photographer most famous for his serial imagery of animals in motion. By setting up twelve cameras in regular physical intervals, he captured time and movement in a series of stills. Compiling these images into a flipbook, zoetrope, or other animation device transforms the twelve still photographs into moving pictures. His published volume of work, *Animal Locomotion* (1887), was vital in sparking the invention of cinema, undertaken simultaneously by notable inventors like Thomas Edison in the US and the Lumière Brothers in France.

Using a process I call Profilography — tracing and extruding a series of sequential contours or profiles — I extract new data from the historical data sets provided by Dürer and Muybridge. Computation affords new geometric possibilities unavailable to artists of the past. Transforming Dürer's facial profiles or Muybridge's side views of running animals into contiguous extrusions yields physical 'morphing' forms. Slicing through the form at any point produces new frames from the interstitial spaces between the originals. For Muybridge, it means an animation with a potentially infinite frame rate. For Dürer, profilography expands his morphological study into thousands of new human forms.

2. Artworks

2.1. Profilography (after Muybridge)

Eadweard Muybridge's 19th century photographic studies of animal locomotion marked the beginning of cinema. What began as a way to settle a wager (does a galloping horse ever fully leave the ground?) evolved into a proof of concept: sequential photographs of action can be assembled to realistically present life in motion. Or, as we know it today: a movie. To capture the action, Muybridge used twelve still cameras at regular intervals to capture one cycle of a horse's gallop. By cinema standards, this is quite sparse. There is a lot of data missing between each frame in comparison to the 30 frames per second of contemporary video.

Muybridge produced hundreds of studies of animals in motion. Plate 624 — a running horse — is the basis for this project. Using Profilography, the twelve photographs become a continuous profile. Slicing through the extrusion yields new frames, derived from Muybridge but absent from his original sequence. Since the model is contiguous, there are an infinite number of frames that can be generated from the original twelve.

After 3D printing the digital model, each print is prepared for investment (lost-wax) casting. In traditional metal casting, a form must first be molded and cast in a series of steps to produce a wax version. That wax version is then slowly covered in a ceramic shell. The wax inside is burned away, leaving a void for the molten bronze. In this project, the 3D prints are directly cast in the ceramic shell and melt away when flash-burned. Since the parts can be made on demand by a 3D printer, this process obviates the need for intensive manual sculpting. The final piece is a 3D manifestation of 2D images originally made to represent 4D (temporal) action, exploring artistic methods across time: millennia of bronze casting, the 19th century (early cinema and photography), and the 21st century (computers and 3D printing).

2.2. Profilography (after Dürer)

In *Vier Bücher von Menschlicher Proportion* (*Four Books on Human Proportion*) (1528), Albrecht Dürer exhaustively examines variations of human form. Not as Vitruvius' depiction of ideal human measurements, but as a full range of proportional possibilities. This physiognomic treatise establishes the basic parameters for drawing the human face and figure, such as relationships between the eye, nose, mouth, and chin. Over dozens of pages, Dürer shows an incredible variety of male and female figures and facial profiles, drawn by hand but made with a precise mechanical approach to geometric variation.

The six facial profiles Dürer presents early in the treatise are the basis for this machine. Using Profilography, the six faces become a continuous facial profile. Slicing through the extrusion yields new faces, derived from Dürer but absent from his analog treatise. After making the form into a closed loop, I 3D printed the form and mounted it onto a motor-driven spindle. As the piece spins, a light casting a shadow along the profile edge animates the transforming faces. Dürer's early experiment into parametric transformations arrives at its 21st century digitally-produced conclusion.

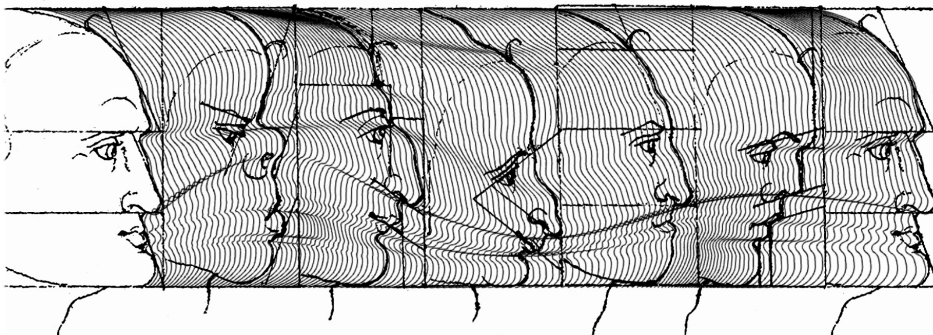


Fig. 1. Profilograph (after Dürer). Dürer's six profiles in *Four Books on Human Proportion* (1528) connected through digital extrusion.

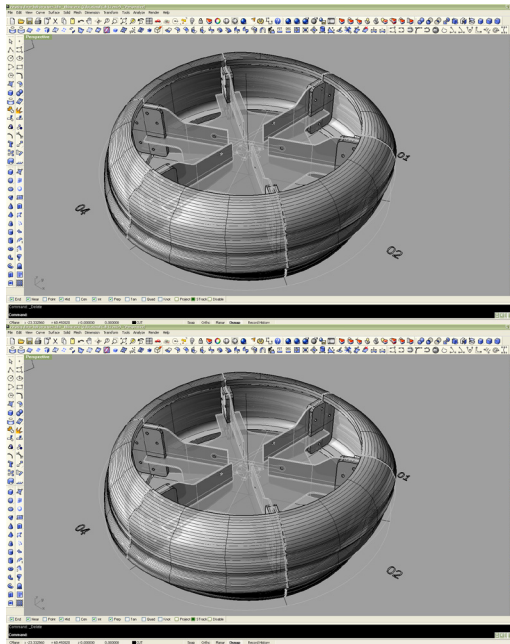


Fig. 2. *Profilograph (after Dürer)*. The facial extrusions are wrapped into a closed loop and fabricated with laser-cut aluminum and 3D printed parts. The form is mounted to a motorized spindle.



Fig. 3. *Profilograph (after Dürer)*. As the form spins, Dürer's original profiles morph between the six original faces.

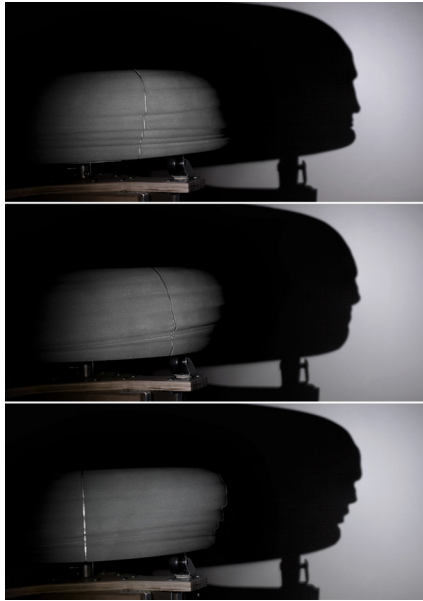


Fig. 4. *Profilograph (after Dürer)*. The installed machine includes a light casting a shadow of the profile edge. The shadow is a 2-dimensional morphing of Dürer's original faces.

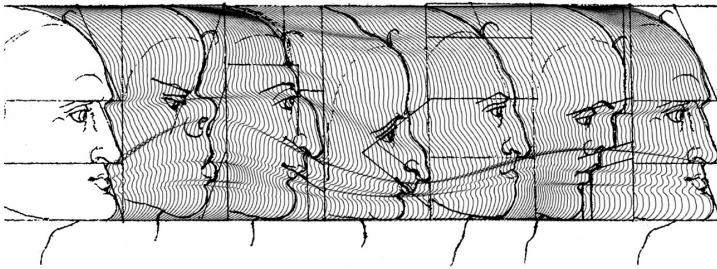


Fig. 5. *Profilograph (after Dürer)* — Video. URL: <http://bit.ly/145wDNV>.

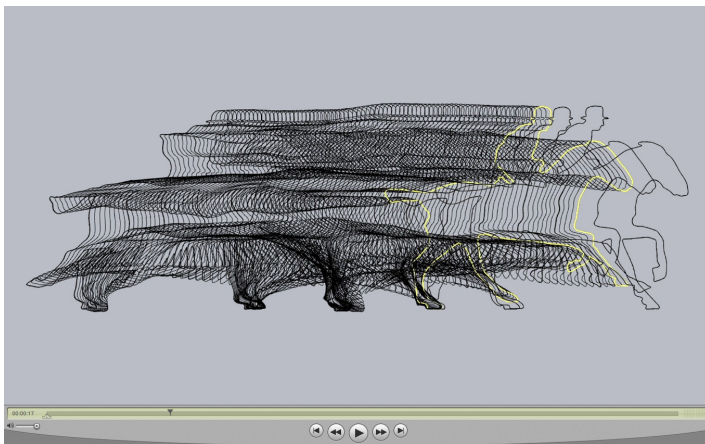


Fig. 6. *Profilograph (after Muybridge)* — Video. URL: <http://bit.ly/Weumxw>.

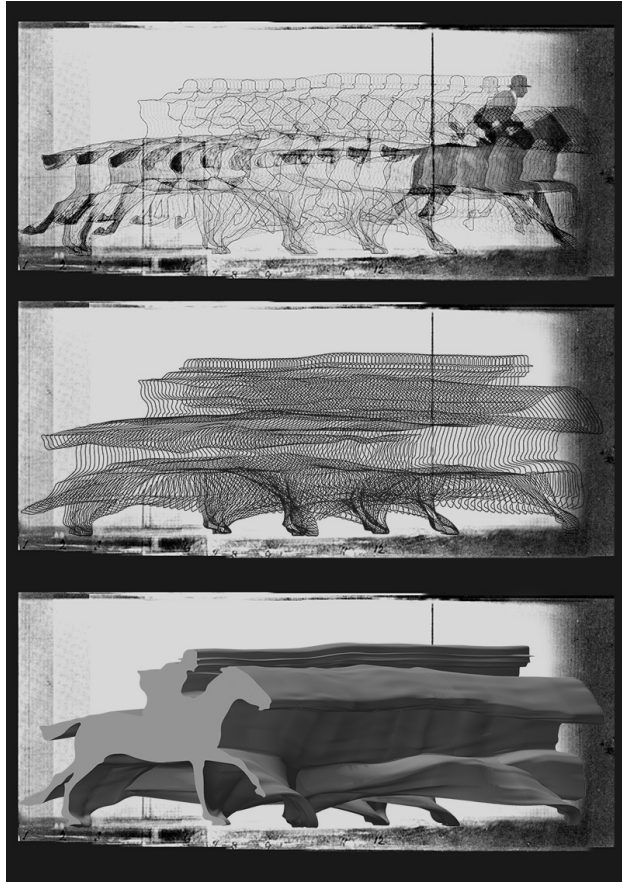


Fig. 7. Profilograph (after Muybridge). Muybridge's original photographic series is first compiled, then transformed through Profilography into a solid.



Fig. 8. Profilograph (after Muybridge). The digital model becomes 3D prints used directly in bronze investment casting. The bronze parts are welded together into a single form.



Fig. 9. *Profilograph* (after Muybridge). Finished bronze sculpture.

References

- Dürer, Albrecht.** *Vier Bücher von Menschlicher Proportion (Four Books on Human Proportion)*. (Reprint) Babenberg Verlag GmbH. 2005.
- Dürer, Albrecht and Strauss, Walter,** ed. *The Human Figure: The Complete "Dresden Sketchbook."* Dover Publications. 1972.
- Hendricks, Gordon.** *Eadweard Muybridge, Father of the Motion Picture*. Dover Publishers. 1975.
- Hill, Paul.** *Eadweard Muybridge*. Phaidon. 2001.
- Kurth, Willy.** *The Complete Woodcuts of Albrecht Dürer*. Courier Dover Publications. 1927.
- Muybridge, Eadweard.** *Animal Locomotion*. Dover Publishers. 1887.